THE HEALTH CONSEQUENCES OF INVOLUNTARY SMOKING

a report of the Surgeon General

1986

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
Center for Health Promotion and Education
Office on Smoking and Health
Rockville, Maryland 20857

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, DC 20402

parents smoke, a stronger relationship exists than if only one parent smokes.

What future respiratory burden these findings may represent for these children later in life is not known. As a former pediatric surgeon, I strongly urge parents to refrain from smoking in the presence of children as a means of protecting not only their children's current health status but also their own.

Diseases Other Than Lung Cancer

Several studies have provided data on the relationship between ETS and cancers other than lung cancer and on ETS exposure and cardiovascular disease. However, further research in these areas will be required to determine whether an association exists between ETS exposure and an increased risk of developing these diseases.

Policies Restricting Smoking in Public Places

The growth in our understanding of the disease risk associated with involuntary smoking has been accompanied by a change in the social acceptability of smoking and by a growing body of legislation, regulation, and voluntary action that addresses where smoking may occur in public. Forty States and the District of Columbia now have some form of legislation controlling or restricting smoking in various public settings. Some States limit smoking to only a few designated areas; however, States are increasingly developing and implementing comprehensive legislation that restricts smoking in many public settings, including the workplace. Nine States have restrictions that cover smoking not only by public employees but also by employees in the private sector.

No systematic evaluation of the effects these measures may have on smoking behavior has been conducted, but there is little doubt that strong public sentiment exists for implementing such restrictions. A number of national surveys conducted by voluntary health organizations, government agencies, and even the tobacco industry have documented that an overwhelming majority of both smokers and nonsmokers support restricting smoking in public.

Public Health Policy and Involuntary Smoking

The 1986 Surgeon General's Report on the Health Consequences of Involuntary Smoking clearly documents that nonsmokers are placed at increased risk for developing disease as the result of exposure to environmental tobacco smoke.

Critics often express that more research is required, that certain studies are flawed, or that we should delay action until more conclusive proof is produced. As both a physician and a public health

Cigarette smoke is well established as a human carcinogen. The chemical composition of ETS is qualitatively similar to mainstream smoke and sidestream smoke and also acts as a carcinogen in bioassay systems. For many nonsmokers, the quantitative exposure to ETS is large enough to expect an increased risk of lung cancer to occur, and epidemiologic studies have demonstrated an increased lung cancer risk with involuntary smoking. In examining a low-dose exposure to a known carcinogen, it is rare to have such an abundance of evidence on which to make a judgment, and given this abundance of evidence, a clear judgment can now be made: exposure to ETS is a cause of lung cancer.

The data presented in this Report establish that a substantial number of the lung cancer deaths that occur among nonsmokers can be attributed to involuntary smoking. However, better data on the extent and variability of ETS exposure are needed to estimate the number of deaths with confidence.

Respiratory Disease

Acute and chronic respiratory diseases have also been linked to involuntary exposure to tobacco smoke; the evidence is strongest in infants. During the first 2 years of life, infants of parents who smoke are more likely than infants of nonsmoking parents to be hospitalized for bronchitis and pneumonia. Children whose parents smoke also develop respiratory symptoms more frequently, and they show small, but measurable, differences on tests of lung function when compared with children of nonsmoking parents.

Respiratory infections in young children represent a direct health burden for the children and their parents; moreover, these infections, and the reductions in pulmonary function found in the school-age children of smokers, may increase susceptibility to develop lung disease as an adult.

Several studies have reported small decrements in the average level of lung function in nonsmoking adults exposed to ETS. These differences may represent a response of the lung to chronic exposure to the irritants in ETS, but it seems unlikely that ETS exposure, by itself, is responsible for a substantial number of cases of clinically significant chronic obstructive lung disease. The small magnitude of the changes associated with ETS exposure suggests that only individuals with unusual susceptibility would be at risk of developing clinically evident disease from ETS exposure alone. However, ETS exposure may be a factor that contributes to the development of clinical disease in individuals with other causes of lung injury.

Cardiovascular Disease

A few studies have examined the relationship between involuntary smoking and cardiovascular disease, but no firm conclusion on

the relationship can be made owing to the limited number of deaths in the studies.

Irritation

Perhaps the most common effect of tobacco smoke exposure is tissue irritation. The eyes appear to be especially sensitive to irritation by ETS, but the nose, throat, and airway may also be affected by smoke exposure. Irritation has been demonstrated to occur at levels that are similar to those found in real-life situations. The level of irritation increases with an increasing concentration of smoke and duration of exposure. In addition, participants in surveys report irritation and annoyance due to smoke in the environment under real-life conditions.

Determinants of Exposure

Exposure to ETS has been documented to be common in the United States, but additional data on the extent and determinants of exposure are needed to identify individuals within the population who have the highest exposure and are at greatest risk. Studies with biological markers and measurements of ETS components in indoor air confirm that measurable exposure to ETS is widespread. However, within exposed populations, levels of cotinine excretion and presumably ETS exposure vary greatly.

In a room or other indoor area, the size of the space, the number of smokers, the amount of ventilation, and other factors determine the concentration of tobacco smoke in the air. The technology for the cost-effective filtration of tobacco smoke from the air is not currently available, and because of their small size, the smoke particles remain suspended in the air for long periods of time; thus, the only way to remove smoke from indoor air is to increase the exchange of indoor air with clean outdoor air. The number of air changes per hour required to maintain acceptable indoor air quality is much higher when smoking is allowed than when smoking is prohibited.

Environmental tobacco smoke originates at the lighted tip of the cigarette, and exposure to ETS is greatest in proximity to the smoker. However, the smoke rapidly disseminates throughout any airspace contiguous with the space in which the smoking is taking place. Dissemination of smoke is not uniform, and substantial gradients in ETS levels have been demonstrated in different parts of the same airspace. The time course of tobacco smoke dissemination is rapid enough to ensure the spread of smoke throughout an airspace within an 8-hour workday. In the home, the presence of even one smoker can significantly increase levels of respirable suspended particulates.

These data lead to the conclusion that the simple separation of smokers and nonsmokers within the same airspace will reduce, but

for parental smoking and childhood cancer is also not clear, and evaluation of this association is made difficult by the various definitions of exposure that have been used, including maternal and paternal smoking before, during, and after the pregnancy. Mothers and fathers who smoke during a pregnancy generally smoked before the conception and continue to smoke after the pregnancy. Thus, an effect of involuntary smoking after birth cannot readily be distinguished from genetic or transplacentally mediated effects.

Cardiovascular Diseases

A causal association between active cigarette smoking and cardiovascular disease is well established (US DHHS 1983). The relationship between cardiovascular disease and involuntary smoking has been examined in one case–control study and three prospective studies. In the case–control study by Lee and colleagues (1986), described previously, ischemic heart disease cases and controls did not show a statistically significant difference in their exposure to involuntary smoking, based on the smoking habits of spouses or on an index accounting for exposure at home, at work, and during travel and leisure. In the Japanese cohort study, Hirayama (1984b, 1985) reported an elevated risk for ischemic heart disease (N=494) in nonsmoking women married to smokers. The standardized mortality ratios when the husbands were nonsmokers, ex-smokers or smokers of 19 or more cigarettes per day, and smokers of 20 or more cigarettes per day were 1.0, 1.10, and 1.31, respectively (one-sided p for trend, 0.019).

In the Scottish followup study (Gillis et al. 1984), nonsmokers not exposed to tobacco smoke were compared with nonsmokers exposed to tobacco smoke with respect to the prevalence of cardiovascular symptoms at entry and mortality due to coronary heart disease. There was no consistent pattern of differences in coronary heart disease or symptoms between nonsmoking men exposed to tobacco smoke and their nonexposed counterparts. Nonsmoking women exposed to tobacco smoke exhibited a higher prevalence of angina and major ECG abnormality at entry, and also a higher mortality rate for all coronary diseases. However, rates of myocardial infarction mortality were higher for exposed nonsmoking men and women compared with the nonexposed nonsmokers. The rates were 31 and 4 per 10,000, respectively, for the nonexposed nonsmoking men and women, and 45 and 12 per 10,000, respectively, for the exposed nonsmoking men and women. None of the differences were tested for statistical significance.

In the Japanese and the Scottish studies, other known risk factors for cardiovascular diseases, i.e., systolic blood pressure, plasma cholesterol, were not accounted for in the analysis.

In a study of heart disease, Garland and coworkers (1985) enrolled 82 percent of adults aged 50 to 79 between 1972 and 1974 in a predominantly white, upper-middle-class community in San Diego, California. Blood pressure and plasma cholesterol were measured at entry, and all participants responded to a standard interview that asked about smoking habits, history of heart disease, and other health-related variables. Excluding women who had a previous history of heart disease or stroke or who had ever smoked, 695 currently married nonsmoking women were classified by their husbands' self-reported smoking status at enrollment. After 10 years of followup, there were 19 deaths due to ischemic heart disease; the age-standardized mortality rates for nonsmoking wives whose husbands were nonsmokers, ex-smokers, and current smokers were 1.2, 3.6, and 2.7, respectively (one-sided p for trend, ≤ 0.10). After adjustment for age, systolic blood pressure, total plasma cholesterol, obesity index, and years of marriage, the relative risk for death due to ischemic heart disease for women married to current or former smokers at entry compared with women married to never smokers was 2.7 (one-sided $p \leq 0.10$).

The study's findings are not convincing from the point of view of sample stability. The total number of deaths due to ischemic heart disease was small, and the denominator in the relative risk calculation is unstable, based on the deaths of two women whose husbands had never smoked. Moreover, it is well established that the risk of coronary heart disease is substantially lower among those who have stopped smoking (US DHHS 1983), although the amount of time required for this change after cessation of smoking is not clear (Kannel 1981). In this study, 15 of 19 deaths occurred in nonsmoking women married to husbands who had stopped smoking at entry, and the age-standardized rate for ischemic heart disease was highest in this group. The high proportion of deaths in nonsmoking women married to men who became ex-smokers implies that the excess resulted from a sustained effect of involuntary smoking. More detailed characterizations of exposure to ETS and specific types of cardiovascular disease associated with this exposure are needed before an effect of involuntary smoking on the etiology of cardiovascular disease can be established.

One study (Aronow 1978a,b) suggested that involuntary smoking aggravates angina pectoris. This study was criticized because the end point, angina, was based on subjective evaluation, and because other factors such as stress were not controlled for (Coodley 1978; Robinson 1978; Waite 1978; Wakehan 1978). More important, the validity of Aronow's work has been questioned (Budiansky 1983).

Conclusions

1. Involuntary smoking can cause lung cancer in nonsmokers.
2. Although a substantial number of the lung cancers that occur in nonsmokers can be attributed to involuntary smoking, more data on the dose and distribution of ETS exposure in the population are needed in order to accurately estimate the magnitude of risk in the U.S. population.
3. The children of parents who smoke have an increased frequency of hospitalization for bronchitis and pneumonia during the first year of life when compared with the children of nonsmokers.
4. The children of parents who smoke have an increased frequency of a variety of acute respiratory illnesses and infections, including chest illnesses before 2 years of age and physician-diagnosed bronchitis, tracheitis, and laryngitis, when compared with the children of nonsmokers.
5. Chronic cough and phlegm are more frequent in children whose parents smoke compared with children of nonsmokers. The implications of chronic respiratory symptoms for respiratory health as an adult are unknown and deserve further study.
6. The children of parents who smoke have small differences in tests of pulmonary function when compared with the children of nonsmokers. Although this decrement is insufficient to cause symptoms, the possibility that it may increase susceptibility to chronic obstructive pulmonary disease with exposure to other agents in adult life, e.g., active smoking or occupational exposures, needs investigation.
7. Healthy adults exposed to environmental tobacco smoke may have small changes on pulmonary function testing, but are unlikely to experience clinically significant deficits in pulmonary function as a result of exposure to environmental tobacco smoke alone.
8. A number of studies report that chronic middle ear effusions are more common in young children whose parents smoke than in children of nonsmoking parents.
9. Validated questionnaires are needed for the assessment of recent and remote exposure to environmental tobacco smoke in the home, workplace, and other environments.
10. The associations between cancers, other than cancer of the lung, and involuntary smoking require further investigation before a determination can be made about the relationship of involuntary smoking to these cancers.
11. Further studies on the relationship between involuntary smoking and cardiovascular disease are needed in order to

determine whether involuntary smoking increases the risk of cardiovascular disease.

isk of

References

ABEL, E.L. Smoking during pregnancy: A review of effects on growth and development of offspring. *Human Biology* 52(4):593–625, December 1980.

ADLKOFER, F., SCHERER, G., Von HEES, U. Passive smoking. (letter). *New England Journal of Medicine* 312(11):719–720, March 14, 1985.

AKIBA, S., KATO, H., BLOT, W.J. Passive smoking and lung cancer among Japanese women. *Cancer Research* 46(9):4804–4807, September 1986.

ARONOW, W.S. Effect of passive smoking on angina pectoris. *New England Journal of Medicine* 299(1):21–24, July 6, 1978a.

ARONOW, W.S. Effects of passive smoking. (letter). *New England Journal of Medicine* 299(16):897, October 19, 1978b.

BACKHOUSE, C.I. Peak expiratory flow in youths with varying cigarette smoking habits. *British Medical Journal* 1(5954):360–362, February 15, 1975.

BARRON, B.A. The effects of misclassification on the estimation of relative risk. *Biometrics* 33(2):414–418, June 1977.

BECK, G.J., DOYLE, C.A., SCHACHTER, E.N. Smoking and lung function. *American Review of Respiratory Disease* 123(2):149–155, February 1981.

BERKEY, C.S., WARE, J.H., DOCKERY, D.W., FERRIS, B.G., Jr., SPEIZER, F.E. Indoor air pollution and pulmonary function growth in preadolescent children. *American Journal of Epidemiology* 123(2):250–260, February 1986.

BEWLEY, B.R., HALIL, T., SNAITH, A.H. Smoking by primary schoolchildren: Prevalence and associated respiratory symptoms. *British Journal of Preventive and Social Medicine* 27(3):150–153, August 1973.

BLACK, N. The aetiology of glue ear: A case-control study. *International Journal of Pediatric Otorhinolaryngology* 9(2):121–133, July 1985.

BLAND, M., BEWLEY, B.R., POLLARD, V., BANKS, M.H. Effect of children's and parents' smoking on respiratory symptoms. *Archives of Disease in Childhood* 53(2):100–105, February 1978.

BLOT, W.J., McLAUGHLIN, J.K. Practical issues in the design and conduct of case-control studies: Use of next-of-kin interviews. In: Blot, W.J., Hirayama, T., Huel, O.G. (eds). *Statistical Issues in Cancer Epidemiology*. Hiroshima, Sanei Publishers, 1985, pp. 46-62.

BRINTON, L.A., BLOT, W.J., BECKER, J.A., WINN, D.M., BROWDER, J.P., FARMER, J.C., Jr., FRAUMENI, J.F., Jr. A case-control study of cancers of the nasal cavity and paranasal sinus. *American Journal of Epidemiology* 119(6):896–906, June 1984.

BRUNEKREEF, B., FISCHER, P., REMIJN, B., VAN DER LENDE, R., SCHOUTEN, J., QUANJER, P. Indoor air pollution and its effect on pulmonary funtion of adult nonsmoking women: 3. Passive smoking and pulmonary function. *International Journal of Epidemiology* 14(2):227–230, June 1985.

BRUNNEMANN, K.D., ADAMS, J.D., HO, D.P.S., HOFFMANN, D. The influence of tobacco smoke on indoor atmospheres: 2. Volatile and tobacco-specific nitrosamines in main- and sidestream smoke and their contribution to indoor pollution. *Proceedings of the Fourth Joint Conference on Sensing of Environmental Pollutants, New Orleans, 1977*. American Chemical Society, 1978, pp. 876–880.

BUDIANSKY, S. Food and drug data fudged. *Nature* 302(5909):560, April 14, 1983.

BURCH, P.R.J. Passive smoking and lung cancer. (letter). *British Medical Journal* 282(6273):1393, April 25, 1981.

BURCH, P.R.J. Lifetime passive smoking and cancer risk. (letter). *Lancet* 1(8433):866, April 13, 1985.

BURCH, P.R.J. Passive smoking in adulthood and cancer risk. (letter). *American Journal of Epidemiology* 123(2):368–369, February 1986.

BURCHFIEL, C.M., HIGGINS, M.W., KELLER, J.B., HOWATT, W.F., BUTLER, W.J., HIGGINS, I.T.T. Passive smoking in childhood: Respiratory conditions and pulmonary function in Tecumseh, Michigan. *American Review of Respiratory Disease* 133(6):966–973, June 1986.

BURROWS, B., KNUDSON, R.J., CLINE, M.G., LEBOWITZ, M.D. Quantitative relationships between cigarette smoking and ventilatory function. *American Review of Respiratory Disease* 115(2):195–205, February 1977.

BURROWS, B., KNUDSON, R.J., LEBOWITZ, M.D. The relationship of childhood respiratory illness to adult obstructive airway disease. *American Review of Respiratory Disease* 115(5):751–760, May 1977.

CAMERON, P., KOSTIN, J.S., ZAKS, J.M., WOLFE, J.H., TIGHE, G., OSELETT, B., STOCKER, R., WINTON, J. The health of smokers' and nonsmokers' children. *Journal of Allergy* 43(6):336–341, June 1969.

CHAN, W.C., COLBOURNE, M.J., FUNG, S.C., HO, H.C. Bronchial cancer in Hong Kong 1976–1977. *British Journal of Cancer* 39(2):182–192, February 1979.

CHAN, W.C., FUNG, S.C. Lung cancer in nonsmokers in Hong Kong. In: Grundmann, E., Clemmesen, J., Muir, C.S. (eds). *Geographical Pathology in Cancer Epidemiology*. Cancer Campaign, Vol. 6. New York, Gustav Fischer Verlag, 1982, pp. 199–202.

CHARLTON, A. Children's coughs related to parental smoking. *British Medical Journal* 288(6431):1647–1649, June 2, 1984.

CHEN, Y., LI, W.-X. The effect of passive smoking on children's pulmonary function in Shanghai. *American Journal of Public Health* 76(5):515–518, May 1986.

COLLEY, J.R.T. Respiratory disease in childhood. *British Medical Bulletin* 27(1):9–14, January 1971.

COLLEY, J.R.T. Respiratory symptoms in children and parental smoking and phlegm production. *British Medical Journal* 2(5912):201–204, April 27, 1974.

COLLEY, J.R.T., HOLLAND, W.W., CORKHILL, R.T. Influence of passive smoking and parental phlegm on pneumonia and bronchitis in early childhood. *Lancet* 2(7888):1031–1034, November 2, 1974.

COLLINS, M.H., MOESSINGER, A.C., KLEINERMAN, J., BASSI, J., ROSSO, P., COLLINS, A.M., JAMES, L.S., BLANC, W.A. Fetal lung hypoplasia associated with maternal smoking: A morphometric analysis. *Pediatric Research* 19(4):408–412, April 1985.

COMSTOCK, G.W., MEYER, M.B., HELSING, K.J., TOCKMAN, M.S. Respiratory effects of household exposures to tobacco smoke and gas cooking. *American Review of Respiratory Disease* 124(2):143–148, August 1981.

COODLEY, A. Effects of passive smoking. (letter). *New England Journal of Medicine* 299(16):897, October 19, 1978.

COPELAND, K.T., CHECKOWAY, H., McMICHAEL, A.J., HOLBROOK, R.H. Bias due to misclassification in the estimation of relative risk. *American Journal of Epidemiology* 105(5):488–495, May 1977.

CORREA, P., PICKLE, L.W., FONTHAM, E., LIN, Y., HAENSZEL, W. Passive smoking and lung cancer. *Lancet* 2(8350):595–597, September 10, 1983.

CRIQUI, M.H. Response bias and risk ratios in epidemiologic studies. *American Journal of Epidemiology* 109(4):394–399, April 1979.

DAHMS, T.E., BOLIN, J.F., SLAVIN, R.G. Passive smoking: Effects on bronchial asthma. *Chest* 80(5):530–534, November 1981.

DODGE, R. The effects of indoor pollution on Arizona children. *Archives of Environmental Health* 37(3):151–155, May-June 1982.

DOLL, R., PETO, R. Cigarette smoking and bronchial carcinoma: Dose and time relationships among regular smokers and lifelong non-smokers. *Journal of Epidemiology and Community Health* 32(4):303–313, December 1978.

DUTAU, G., CORBERAND, J., LEOPHONTE, P., ROCHICCIOLI, P. Manifestations respiratoires liees a l'inhalation passive de fumme de tabac chez l'infant d'age prescolaire [Respiratory signs associated with passive inhalation of tobacco smoke in infants]. *Le Poumon et le Coeur* 35(2):63–69, 1979.

EKWO, E.E., WEINBERGER, M.M., LACHENBRUCH, P.A., HUNTLEY, W.H. Relationship of parental smoking and gas cooking to respiratory disease in children. *Chest* 84(6):662–668, December 1983.

FERGUSSON, D.M., HORWOOD, L.J. Parental smoking and respiratory illness during early childhood: A six year longitudinal study. *Pediatric Pulmonology* 1(2):99–106, March-April 1985.

FERGUSSON, D.M., HORWOOD, L.J., SHANNON, F.T., TAYLOR, B. Parental smoking and lower respiratory illness in the first three years of life. *Journal of Epidemiology and Community Health* 35(3):180–184, September 1981.

FEYERABEND, C., HIGENBOTTAM, T., RUSSELL, M.A.H. Nicotine concentrations in urine and saliva of smokers and nonsmokers. *British Medical Journal* 284(6321):1002–1004, April 3, 1982.

FOLIART, D., BENOWITZ, N.L., BECKER, C.E. Passive absorption of nicotine in airline flight attendants. (letter). *New England Journal of Medicine* 308(18):1105, May 5, 1983.

FRIEDMAN, G.D. Passive smoking in adulthood and cancer risk. (letter). *American Journal of Epidemiology* 123(2):367, February 1986.

FRIEDMAN, G.D., PETTITI, D.B., BAWOL, R.D. Prevalence and correlates of passive smoking. *American Journal of Public Health* 73(4):401–405, April 1983.

GARFINKEL, L. Time trends in lung cancer mortality among nonsmokers and a note on passive smoking. *Journal of the National Cancer Institute* 66(6):1061–1066, June 1981.

GARFINKEL, L., AUERBACH, O., JOUBERT, L. Involuntary smoking and lung cancer: A case–control study. *Journal of the National Cancer Institute* 75(3):463–469, September 1985.

GARLAND, C., BARRETT-CONNOR, E., SUAREZ, L., CRIQUI, M.H., WINGARD, D.L. Effects of passive smoking on ischemic heart disease mortality of nonsmokers: A prospective study. *American Journal of Epidemiology* 121(5):645–650, May 1985.

GILLIS, C.R., HOLE, D.J., HAWTHORNE, V.M., BOYLE, P. The effect of environmental tobacco smoke in two urban communities in the west of Scotland. *European Journal of Respiratory Diseases* 65(Suppl. 133):121–126, 1984.

GOLD, E., GORDIS, L., TONASCIA, J., SZKLO, M. Risk factors for brain tumors in children. *American Journal of Epidemiology* 109(3):309–319, March 1979.

GORDIS, L. Should dead cases be matched to dead controls? *American Journal of Epidemiology* 115(1):1–5, January 1982.

GORTMAKER, S.L., WALKER, D.K., JACOBS, F.H., RUCH-ROSS, H. Parental smoking and the risk of childhood asthma. *American Journal of Public Health* 72(6):574–579, June 1982.

GREENBERG, R.A., HALEY, N.J., ETZEL, R.A., LODA, F.A. Measuring the exposure of infants to tobacco smoke: Nicotine and cotinine in urine and saliva. *New England Journal of Medicine* 310(17):1075–1078, April 26, 1984.

GREENLAND, S. The effect of misclassification in the presence of covariates. *American Journal of Epidemiology* 112(4):564–569, October 1980.

GRUFFERMAN, S., WANG, H.H., DeLONG, E.R., KIMM, S.Y.S., DELZELL, E.S., FALLETA, J.M. Environmental factors in the etiology of rhabdomyosarcoma in childhood. *Journal of the National Cancer Institute* 68(1):107–113, January 1982.

GRUNDMANN, E., MULLER, K.-M., WINTER, K.D., STERLING, T.D. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 282(6270):1156, April 4, 1981.

HALEY, N.J., HOFFMANN, D. Analysis for nicotine and cotinine in hair to determine cigarette smoker status. *Clinical Chemistry* 31(10):1598–1600, October 1985.

HAMMOND, E.C., SELIKOFF, I.J. Passive smoking and lung cancer with comments on two new papers. *Environmental Research* 24(2):444–452, April 1981.

HARLAP, S., DAVIES, A.M. Infant admissions to hospital and maternal smoking. *Lancet* 1(7857):529–532, March 30, 1974.

HARRIS, J.E., DuMOUCHEL, W.H. Nonsmoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6296):915, October 3, 1981.

HASSELBLAD, V., HUMBLE, C.G., GRAHAM, M.G., ANDERSON, H.S. Indoor environmental determinants of lung function in children. *American Review of Respiratory Disease* 123(5):479–485, May 1981.

HENDERSON, B.E., BENTON, B., JING, J., YU, M.C., PIKE, M.C. Risk factors for cancer of the testis in young men. *International Journal of Cancer* 23(5):598–602, May 1979.

HIGGINS, I. Lifetime passive smoking and cancer risk. (letter). *Lancet* 1(8433):866–867, April 13, 1985.

HIGGINS, M.W., KJELSBERG, M., METZNER, H. Characteristics of smokers and nonsmokers in Tecumseh Michigan. 1: The distribution of smoking habits in persons and families and their relationship to social characteristics. *American Journal of Epidemiology* 86(1):45–59, July 1967.

HILLER, F.C. Deposition of sidestream cigarette smoke in the human respiratory tract. *Preventive Medicine* 13(6):602–607, November 1984.

HIRAYAMA, T. Non-smoking wives of heavy smokers have a higher risk of lung cancer: A study from Japan. *British Medical Journal* 282(6259):183–185, January 17, 1981a.

HIRAYAMA, T. Passive smoking and lung cancer. (letter). *British Medical Journal* 282(6273):1393–1394, April 25, 1981b.

HIRAYAMA, T. Nonsmoking wives of smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6296):916–917, October 3, 1981c.

HIRAYAMA, T. Nonsmoking wives of smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6304):1465–1466, November 28, 1981d.

HIRAYAMA, T. Passive smoking and lung cancer: Consistency of association. (letter). *Lancet* 2(8364):1425–1426, December 17, 1983.

HIRAYAMA, T. Cancer mortality in nonsmoking women with smoking husbands based on a large-scale cohort study in Japan. *Preventive Medicine* 13(6):680–690, November 1984a.

HIRAYAMA, T. Lung cancer in Japan: Effects of nutrition and passive smoking. In: Mizell, M., Correa, P. (eds). *Lung Cancer: Causes and Prevention*. Deerfield Beach, Florida, VCH, 1984b, pp. 175–195.

HIRAYAMA, T. Passive smoking: A new target of epidemiology. *Journal of Experimental Clinical Medicine* 10(4):287–293, 1985.

HOEGG, U.R. Cigarette smoke in closed spaces. *Environmental Health Perspectives* (2):177–128, October 1972.

HOFFMANN, D., HALEY, N.J., ADAMS, J.D., BRUNNEMANN, K.D. Tobacco sidestream smoke: Uptake by nonsmokers. *Preventive Medicine* 13(6):608–617, November 1984.

HORWOOD, L.J., FERGUSSON, D.M., SHANNON, F.T. Social and familial factors in the development of early childhood asthma. *Pediatrics* 75(5):859–868, May 1985.

HUGOD, C., HAWKINS, L.H., ASTRUP, P. Exposure of passive smokers to tobacco smoke constituents. *International Archives of Occupational and Environmental Health* 42(1):21–29, 1978.

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER. *Tobacco Smoking*. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol. 38. Lyon, IARC, 1986, pp. 163–314.

IVERSON, M., BIRCH, L., LUNDQVIST, G.R., ELBROND, O. Middle ear effusion in children and the indoor environment: An epidemiological study. *Archives of Environmental Health* 40(2):74–79, March-April 1985.

JARVIS, M.J., TUNSTALL-PEDOE, H., FEYERABEND, C., VESEY, C., SALOOJEE, Y. Biochemical markers of smoke absorption and self-reported exposure to passive smoking. *Journal of Epidemiology and Community Health* 38(4):335–339, December 1984.

JONES, J.R., HIGGINS, I.T.T., HIGGINS, M.W., KELLER, J.B. Effects of cooking fuels on lung function in nonsmoking women. *Archives of Environmental Health* 38(4):219–222, July-August 1983.

KABAT, G.C., WYNDER, E.L. Lung cancer in nonsmokers. *Cancer* 53(5):1214–1221, March 1, 1984.

KANNEL, W.B. Update on the role of cigarette smoking in coronary artery disease. *American Heart Journal* 101(3):319–328, March 1981.

KASUGA, H., HASEBE, A., OSAKA, F., MATSUKI, H. Respiratory symptoms in school children and the role of passive smoking. *Tokai Journal of Experimental and Clinical Medicine* 4(2):101–114, April 1979.

KAUFFMANN, F., DOCKERY, D.W., SPEIZER, F.E., FERRIS, B.G., Jr. Respiratory symptoms and lung function in women with passive and active smoking. (abstract). *American Review of Respiratory Disease* 133(4, part 2):A157, April 1986.

KAUFFMANN, F., TESSIER, J.-F., ORIOL, P. Adult passive smoking in the home environment: A risk factor for chronic airflow limitation. *American Journal of Epidemiology* 117(3):269–280, March 1983.

KENTNER, M., TRIEBIG, G., WELTLE, D. The influence of passive smoking on pulmonary function: A study of 1351 office workers. *Preventive Medicine* 13(6):656–669, November 1984.

KNOTH, A., BOHN, H., SCHMIDT, F. Passiv rauchen als Lungenkrebs-Ursache bei Nichtraucherinnen [Passive smoking as a causal factor of bronchial carcinoma in female nonsmokers]. *Medizinische Klinik* 78(2):66–69, February 4, 1983.

KOO, L.C., HO, J.H.-C., LEE, N. An analysis of some risk factors for lung cancer in Hong Kong. *International Journal of Cancer* 35(2):149–155, February 15, 1985.

KOO, L.C., HO, J.H.-C., SAW, D. Active and passive smoking among female lung cancer patients and controls in Hong Kong. *Journal of Experimental and Clinical Cancer Research* 4(2):367–375, October-December 1983.

KOO, L.C., HO, J.H.-C., SAW, D. Is passive smoking an added risk factor for lung cancer in Chinese women? *Journal of Experimental and Clinical Cancer Research* 3(3):277–283, July-September 1984.

KORNEGAY, K.R., KASTENBAUM, M.A. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6296):914, October 3, 1981.

KRAEMER, M.J., RICHARDSON, M.A., WEISS, N.S., FURUKAWA, C.T., SHAPIRO, G.G., PIERSON, W.E., BIERMAN, C.W. Risk factors for persistent middle-ear effusions: Otitis media, catarrh, cigarette smoke exposure, and atopy. *Journal of the American Medical Association* 249(8):1022–1025, February 25, 1983.

LEBOWITZ, M.D. Environmental tobacco smoke: 3.3. The effects of environmental tobacco smoke exposure and gas stoves on daily peak flow rates in asthmatic and non-asthmatic families. *European Journal of Respiratory Diseases* 65(Suppl. 133):90–97, 1984.

LEBOWITZ, M.D., ARMET, D.B., KNUDSON, R. The effect of passive smoking on pulmonary function in children. *Environment International* 8(1-6):371–373, 1982.

LEBOWITZ, M.D., BURROWS, B. Respiratory symptoms related to smoking habits of family adults. *Chest* 69(1):48–50, January 1976.

LEE, P.N. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6304):1465–1466, November 28, 1981.

LEE, P.N. Passive smoking. (letter). *Lancet* 1(8275):791, April 3, 1982a.

LEE, P.N. Passive smoking. *Food and Cosmetics Toxicology* 20(2):223–229, April 1982b.

LEE, P.N. Lifetime passive smoking and cancer risk. (letter). *Lancet* 1(8443):1444, June 22, 1985.

LEE, P.N., CHAMBERLAIN, J., ALDERSON, M.R. Relationship of passive smoking to risk of lung cancer and other smoking-associated diseases. *British Journal of Cancer* 54(1):97–105, July 1986.

LEEDER, S.R., CORKHILL, R.T., IRWIG, L.M., HOLLAND, W.W. Influence of family factors on asthma and wheezing during the first five years of life. *British Journal of Preventive and Social Medicine* 30(4):213–218, December 1976a.

LEEDER, S.R., CORKHILL, R.T., IRWIG, L.M., HOLLAND, W.W. Influence of family factors on the incidence of lower respiratory illness during the first year of life. *British Journal of Preventive and Social Medicine* 30(4):203–212, December 1976b.

LEHNERT, G. Roundtable discussion. *Preventive Medicine* 13(6):730–746, November 1984.

LERCHEN, M.L., SAMET, J.M. An assessment of the validity of questionnaire responses provided by a surviving spouse. *American Journal of Epidemiology* 123(3):481–489, March 1986.

LIM, T.P.K. Airway obstruction among high school students. *American Review of Respiratory Disease* 108(4):985–988, October 1973.

MacDONALD, E.J. Nonsmoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6296):917, October 3, 1981a.

MacDONALD, E.J. Nonsmoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6304):1465, November 28, 1981b.

MANNING, M.D., CARROLL, B.E.. Some epidemiological aspects of leukemia in children. *Journal of the National Cancer Institute* 19(6):1087–1094, December 1957.

MANTEL, N. Nonsmoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6296):914–915, October 3, 1981.

MANTEL, N. Passive smoking in adulthood and cancer risk. (letter). *American Journal of Epidemiology* 123(2):367–368, February 1986.

MARTINEZ, F., ANTOGNONI, G., MACRI, F., LEBOWITZ, M., RONCHETTI, R. Distribution of bronchial responsiveness to a constrictive drug in a random pediatric population sample. (abstract). *American Review of Respiratory Disease* 131(4, part 2):A242, April 1985.

MATSUKURA, S., HAMADA, H., SEINO, Y., MURANAKA, H., HIGASHI, E. Passive smoking. (letter). *New England Journal of Medicine* 312(11):720–721, March 14, 1985.

MATSUKURA, S., TAMINATO, T., KITANO, N., SEINO, Y., HAMADA, H., UCHIHASHI, M., NAKAJIMA, H., HIRATA, Y. Effects of environmental tobacco smoke on urinary cotinine excretion in nonsmokers: Evidence for passive smoking. *New England Journal of Medicine* 311(13):828–832, September 27, 1984.

McCONNOCHIE, K.M., ROGHMANN, K.J. Bronchiolitis as a possible cause of wheezing in childhood: New evidence. *Pediatrics* 74(1):1–10, July 1984.

McCONNOCHIE, K.M., ROGHMANN, K.J. Predicting clinically significant lower respiratory tract illness in childhood following mild bronchiolitis. *American Journal of Diseases of Children* 139(6):625–631, June 1985.

MURRAY, A.B., MORRISON, B.J. The effect of cigarette smoke from the mother on bronchial responsiveness and severity of symptoms in children with asthma. *Journal of Allergy and Clinical Immunology* 77(4):575–581, April 1986.

NATIONAL ACADEMY OF SCIENCES. *Risk Assessment in the Federal Government: Managing the Process*. Washington, D.C., National Academy Press, 1983.

NEUTEL, C.I., BUCK, C. Effect of smoking during pregnancy on the risk of cancer in children. *Journal of the National Cancer Institute* 47(1):59–63, July 1971.

O'CONNOR, G., WEISS, S.T., TAGER, I., SPEIZER, F.E. The effect of passive smoking on nonspecific bronchial responsiveness in a population sample of children and young adults. (abstract). *Clinical Research* 34(2):581A, April 1986.

PATHAK, D.R., SAMET, J.M., HUMBLE, C.G., SKIPPER, B.J. Determinants of lung cancer risk in cigarette smokers in New Mexico. *Journal of the National Cancer Institute* 76(4):597–604, April 1986.

PEDREIRA, F.A., GUANDOLO, V.L., FEROLI, E.J., MELLA, G.W., WEISS, I.P. Involuntary smoking and incidence of respiratory illness during the first year of life. *Pediatrics* 75(3):594–597, March 1985.

PERSHAGEN, G., ZDENEK, H., SVENSSON, C. Passive smoking and lung cancer in Swedish women. *American Journal of Epidemiology*, in press.

PETERS, J.M., FERRIS, B.G., Jr. Smoking, pulmonary function, and respiratory symptoms in a college-age group. *American Review of Respiratory Disease* 95(5):774–782, May 1967.

PICKLE, L.W., BROWN, L.M., BLOT, W.J. Information available from surrogate respondents in case-control interview studies. *American Journal of Epidemiology* 118(1):99–108, July 1983.

PIMM, P.E., SILVERMAN, F., SHEPHARD, R.J. Physiological effects of acute passive exposure to cigarette smoke. *Archives of Environmental Health* 33(4):201–213, July-August 1978.

PITTENGER, D.J. Passive smoking. (letter). *New England Journal of Medicine* 312(11):720, March 14, 1985.

PRESTON-MARTIN, S., YU, M.C., BENTON, B., HENDERSON, B.E. N-nitroso compounds and childhood brain tumors: A case-control study. *Cancer Research* 42(12):5240–5245, December 1982.

PULLAN, C.R., HEY, E.N. Wheezing, asthma, and pulmonary dysfunction 10 years after infection with respiratory syncytial virus in infancy. *British Medical Journal* 284(6330):1665–1669, June 5, 1982.

PUKANDER, J., LUOTONEN, J., TIMONEN, M., KARMA, P. Risk factors affecting the occurrence of acute otitis media among 2–3-year-old urban children. *Acta Oto-laryngolica* 100(3-4):260–265, September-October 1985.

RANTAKALLIO, P. Relationship of maternal smoking to morbidity and mortality of the child up to the age of five. *Acta Paediatrica Scandinavica* 67(5):621–631, September 1978.

RAWBONE, R.G., KEELING, C.A., JENKINS, A., GUZ, A. Cigarette smoking among secondary school children in 1975: Prevalence of respiratory symptoms, knowledge of health hazards, and attitudes to smoking and health. *Journal of Epidemiology and Community Health* 32(1):53–58, March 1978.

REPACE, J.L., LOWREY, A.H. A quantitative estimate of nonsmokers' lung cancer risk from passive smoking. *Environment International* 11(1):3–22, 1985.

ROBINSON, B.F. Effects of passive smoking. (letter). *New England Journal of Medicine* 299(16):896, October 19, 1978.

RUSH, D. Respiratory symptoms in a group of American secondary school students: The overwhelming association with cigarette smoking. *International Journal of Epidemiology* 3(2):153–165, June 1974.

RUSSELL, M.A.H., FEYERABEND C. Blood and urinary nicotine in nonsmokers. *Lancet* 7900(1):179–181, January 25, 1975.

RUSSELL, M.A.H., JARVIS, M.J., WEST, R.J. Use of urinary nicotine concentrations to estimate exposure and mortality from passive smoking in non-smokers. *British Journal of Addiction* 81:275–281, 1986.

RUTSCH, M. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 282(6268):985, March 21, 1981.

SACKETT, D.L. Bias in analytic research. *Journal of Chronic Diseases* 32(1-2):51–63, 1979.

SAID, G., ZALOKAR, J., LELLOUCH, J., PATOIS, E. Parental smoking related to adenoidectomy and tonsillectomy in children. *Journal of Epidemiology and Community Health* 32(2):97–101, June 1978.

SALOOJEE, Y., VESEY, C.J., COLE, P.V., RUSSELL, M.A.H. Carboxyhemoglobin and plasma thiocyanate: Complementary indicators of smoking behaviour? *Thorax* 37(7):521–525, July 1982.

SAMET, J.M., TAGER I.B., SPEIZER, F.E. The relationship between respiratory illness in childhood and chronic air-flow obstruction in adulthood. *American Review of Respiratory Disease* 127(4):508–523, April 1983.

SANDLER, D.P., EVERSON, R.B., WILCOX, A.J. Passive smoking in adulthood and cancer risk. *American Journal of Epidemiology* 121(1):37–48, January 1985.

SANDLER, D.P., EVERSON, R.B., WILCOX, A.J. Passive smoking in adulthood and cancer risk. (letter). *American Journal of Epidemiology* 123(2):369–370, February 1986.

SANDLER, D.P., EVERSON, R.B., WILCOX, A.J., BROWDER, J.P. Cancer risk in adulthood from early life exposure to parents' smoking. *American Journal of Public Health* 75(5):487–492, May 1985.

SANDLER, D.P., WILCOX, A.J., EVERSON, R.B. Cumulative effects of lifetime passive smoking on cancer risk. *Lancet* 1(8424):312–314, February 9, 1985a.

SANDLER, D.P., WILCOX, A.J., EVERSON, R.B. Lifetime passive smoking and cancer risk. (letter). *Lancet* 1(8433):867, April 13, 1985b.

SCHENKER, M.B., SAMET, J.M., SPEIZER, F.E. Effect of cigarette tar content and smoking habits on respiratory symptoms in women. *American Review of Respiratory Disease* 125(6):684–690, June 1982.

SCHENKER, M.B., SAMET, J.M., SPEIZER, F.E. Risk factors for childhood respiratory disease: The effect of host factors and home environmental exposures. *American Review of Respiratory Disease* 128(6):1038–1043, December 1983.

SCHILLING, R.S.F., LETAI, A.D., HUI, S.L., BECK, G.J., SCHOENBERG, J.B., BOUHUYS, A.H. Lung function, respiratory disease, and smoking in families. *American Journal of Epidemiology* 106(4):274–283, October 1977.

SCHLESSELMAN, J.J. *Case-Control Studies: Design, Conduct, Analysis*. Monographs in Epidemiology and Biostatistics, Vol. 2. New York, Oxford University Press, 1982.

SCHMELTZ, I., HOFFMANN, D., WYNDER, E.L. The influence of tobacco smoke on indoor atmospheres: I. An overview. *Preventive Medicine* 4(1):66–82, March 1975.

SEELY, J.E., ZUSKIN, E., BOUHUYS, A. Cigarette smoking: Objective evidence for lung damage in teen-agers. *Science* 172(3984):741–743, May 14, 1971.

SHEPHARD, R.J., COLLINS, R., SILVERMAN, F. "Passive" exposure of asthmatic subjects to cigarette smoke. *Environmental Research* 20(2):392–402, December 1979.

SIMS, D.G., DOWNHAM, M.A.P.S., GARDNER, P.S., WEBB, J.K.G., WEIGHTMAN, D. Study of 8-year-old children with a history of respiratory syncytial virus bronchiolitis in infancy. *British Medical Journal* 1(6104):11–14, January 7, 1978.

SPEIZER, F.E., FERRIS, B., Jr., BISHOP, Y.M.M., SPENGLER, J. Respiratory disease rates and pulmonary function in children associated with NO_2 exposure. *American Review of Respiratory Disease* 121(1):3–10, January 1980.

SPEIZER, F.E., TAGER, I.B. Epidemiology of chronic mucus hypersecretion and obstructive airways disease. *Epidemiologic Reviews* 1:124–142, 1979.

SPINACI, S., AROSSA, W., BURGIANI, M., NORTALE, P., BUCCA, C., DeCONDUSSION, E. The effects of air pollution on the respiratory health of children: A cross-sectional study. *Pediatric Pulmonology* 1(5):262–266, 1985.

STERLING, T.D. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 282(6270):1156, April 4, 1981.

STEWART, A., WEBB, J., HEWITT, D. A survey of childhood malignancies. *British Medical Journal* 50(86):1495–1508, June 18, 1958.

STJERNFELDT, M., BERGLUND, K., LINDSTEN, J., LUDVIGSSON, J. Maternal smoking during pregnancy and risk of childhood cancer. *Lancet* 1(8494):1350–1352, June 14, 1986.

STÖBER, W. Lung dynamics and uptake of smoke constituents by nonsmokers: A survey. *Preventive Medicine* 13(6):589–601, November 1984.

SUTTON, G.C. Passive smoking and lung cancer. (letter). *British Medical Journal* 282(6265):733, February 28, 1981.

SVENDSEN, K.H., KULLER, L.H., NEATON, J.D. Effects of passive smoking in the Multiple Risk Factor Intervention Trial (MRFIT). *Circulation*, Part II, No. 4, October 1985.

TAGER, I.B. Passive smoking and respiratory health in children: Sophistry or cause for concern? *American Review of Respiratory Disease* 133(6):959–961, June 1986.

TAGER, I.B., MUÑOZ, A., ROSNER, B., WEISS, S.T., CAREY, V., SPEIZER, F.E. Effect of cigarette smoking on the pulmonary function of children and adolescents. *American Review of Respiratory Disease* 131(5):752–759, May 1985.

TAGER, I.B., WEISS, S.T., MUÑOZ, A., ROSNER, B., SPEIZER, F.E. Longitudinal study of the effects of maternal smoking on pulmonary function in children. *New England Journal of Medicine* 309(12):699–703, September 22, 1983.

TAGER, I.B., WEISS, S.T., ROSNER, B., SPEIZER, F.E. Effect of parental cigarette smoking on the pulmonary function of children. *American Journal of Epidemiology* 110(1):15–26, July 1979.

TASHKIN, D., CLARK, V.A., SIMMONS, M., REEMS, C., COULSON, A.H., BOURQUE, L.B., SAYRE, J.W., DETELS, R., ROKAW, S. The UCLA population studies of chronic obstructive respiratory disease: 7. Relationship between parental smoking and children's lung function. *American Review of Respiratory Disease* 129(6):891–897, June 1984.

TRICHOPOULOS, D. Passive smoking and lung cancer. (letter). *Lancet* 1(8378):684, March 24, 1984.

TRICHOPOULOS, D., KALANDIDI, A., SPARROS, L. Lung cancer and passive smoking: Conclusion of Greek study. (letter). *Lancet* 2(8351):677–678, September 17, 1983.

TRICHOPOULOS, D., KALANDIDI, A., SPARROS, L., MacMAHON, B. Lung cancer and passive smoking. *International Journal of Cancer* 27(1):1–4, January 15, 1981.

TSOKOS, C.P. Non-smoking wives of heavy smokers have a higher risk of lung cancer. (letter). *British Medical Journal* 283(6304):1464–1465, November 28, 1981.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE. *Smoking and Health: A Report of the Surgeon General*. DHEW Pub. No. (PHS)79-50066. U.S. Department of Health, Education, and Welfare, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1979.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. *The Health Consequences of Smoking for Women: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1980.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. *The Health Consequences of Smoking: Cancer. A Report of the Surgeon General*. DHHS Pub. No. (PHS)82-50179. U.S. Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1982.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. *The Health Consequences of Smoking: Cardiovascular Disease. A Report of the Surgeon General*. DHHS Pub. No. (PHS)84-50204. U.S. Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1983.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. *The Health Consequences of Smoking: Chronic Obstructive Lung Disease. A Report of the Surgeon General.* DHHS Pub. No. (PHS)84-50205. U.S. Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1984.

U.S. PUBLIC HEALTH SERVICE. *Smoking and Health. Report of the Advisory Committee to the Surgeon General of the Public Health Service.* PHS Pub. No. 1103. U.S. Department of Health, Education, and Welfare, Public Health Service, Centers for Disease Control, 1964.

VAN STEENSEL-MOLL, H.A., VALKENBURG, H.A., VANDENBROUCKE, J.P. Are maternal fertility problems related to childhood leukaemia? *International Journal of Epidemiology* 14(4):555–559, December 1985.

VEDAL, S., SCHENKER, M.B., SAMET, J.M., SPEIZER, F.E. Risk factors for childhood respiratory disease: Analysis of pulmonary function. *American Review of Respiratory Disease* 130(2):187–192, August 1984.

VUTUC, C. Quantitative aspects of passive smoking and lung cancer. *Preventive Medicine* 13(6):698–704, November 1984.

WAITE, C.L. Effects of passive smoking. (letter). *New England Journal of Medicine* 299(16):897, October 19, 1978.

WAKEHAN, H. Effects of passive smoking. (letter). *New England Journal of Medicine* 299(16):896, October 19, 1978.

WALD, N.J., BOREHAM, J., BAILEY, A., RITCHIE, C., HADDOW, J.E., KNIGHT, G. Urinary cotinine as marker of breathing other people's tobacco smoke. (letter). *Lancet* 1(8370):230–231, January 28, 1984.

WALD, N.J., IDLE, M., BOREHAM, J., BAILEY, A. Carbon monoxide in breath in relation to smoking and carboxyhaemoglobin levels. *Thorax* 36(5):366–369, May 1981.

WALD, N.J., RITCHIE, C. Validation of studies on lung cancer in nonsmokers married to smokers. (letters). *Lancet* 1(8385):1067, May 12, 1984.

WALTER, S., NANCY, N.R., COLLIER, C.R. Changes in forced expiratory spirogram in young male smokers. *American Review of Respiratory Disease* 119(5):717–724, 1974.

WARE, J.H., DOCKERY, D.W., SPIRO, A. III, SPEIZER, F.E., FERRIS, B.G., Jr. Passive smoking, gas cooking, and respiratory health of children living in six cities. *American Review of Respiratory Disease* 129(3):366–374, March 1984.

WEINBERGER, S.E., WEISS, S.T. Pulmonary diseases. In: Burrow, G.N., Ferris, T.F. (eds). *Medical Complications During Pregnancy.* 2nd ed. Philadelphia, W.B. Saunders, 1981, pp. 405–434.

WEISS, S.T., TAGER, I.B., MUÑOZ, A., SPEIZER, F.E. The relationship of respiratory infections in early childhood to the occurrence of increased levels of bronchial responsiveness and atopy. *American Review of Respiratory Disease* 131(4):573–578, April 1985.

WEISS, S.T., TAGER, I.B., SPEIZER, F.E., ROSNER, B. Persistent wheeze: Its relation to respiratory illness, cigarette smoking, and level of pulmonary function in a population sample of children. *American Review of Respiratory Disease* 122(5):697–707, November 1980.

WHITE, J.R., FROEB, H.F. Small-airways dysfunction in nonsmokers chronically exposed to tobacco smoke. *New England Journal of Medicine* 302(13):720–723, March 27, 1980.

WHITTEMORE, A., ALTSHULER, B. Lung cancer incidence in cigarette smokers: Further analysis of Doll and Hill's data for British physicians. *Biometrics* 32(4):805–816, December 1976.

WIEDEMANN, H.P., MAHLER, D.A., LOKE J., VIRGULTO, J.A., SNYDER, P., MATTHAY, R.A. Acute effects of passive smoking on lung function and airway reactivity in asthmatic subjects. *Chest* 89(2):180–185, February 1986.

WOOLCOCK, A.J., PEAT, J.K., LEEDER, S.R., BLACKBURN, C.R.B. (eds.). The development of lung function in Sydney children: Effects of respiratory illness and smoking. A ten year study. *European Journal of Respiratory Diseases* 65(Suppl 132):1–137, 1984.

WU, A.H., HENDERSON, B.E., PIKE, M.C., YU, M.C. Smoking and other risk factors for lung cancer in women. *Journal of the National Cancer Institute* 74(4):747–751, April 1985.

WYNDER, E.L., HOFFMANN, D. *Tobacco and Tobacco Smoke: Studies in Experimental Carcinogenesis*. New York, Academic Press, 1967.

WYNDER, E.L. STELLMAN, S.D. Comparative epidemiology of tobacco-related cancers. *Cancer Research* 37(12):4608–4622, December 1977.

YARNELL, J.W.G., ST. LEGER, A.S. Respiratory illness, maternal smoking habit and lung function in children. *British Journal of Diseases of the Chest* 73(3):230–236, July 1979.